AEROSPACE AND UNMANNED OPPORTUNITIES IN VIRGINIA

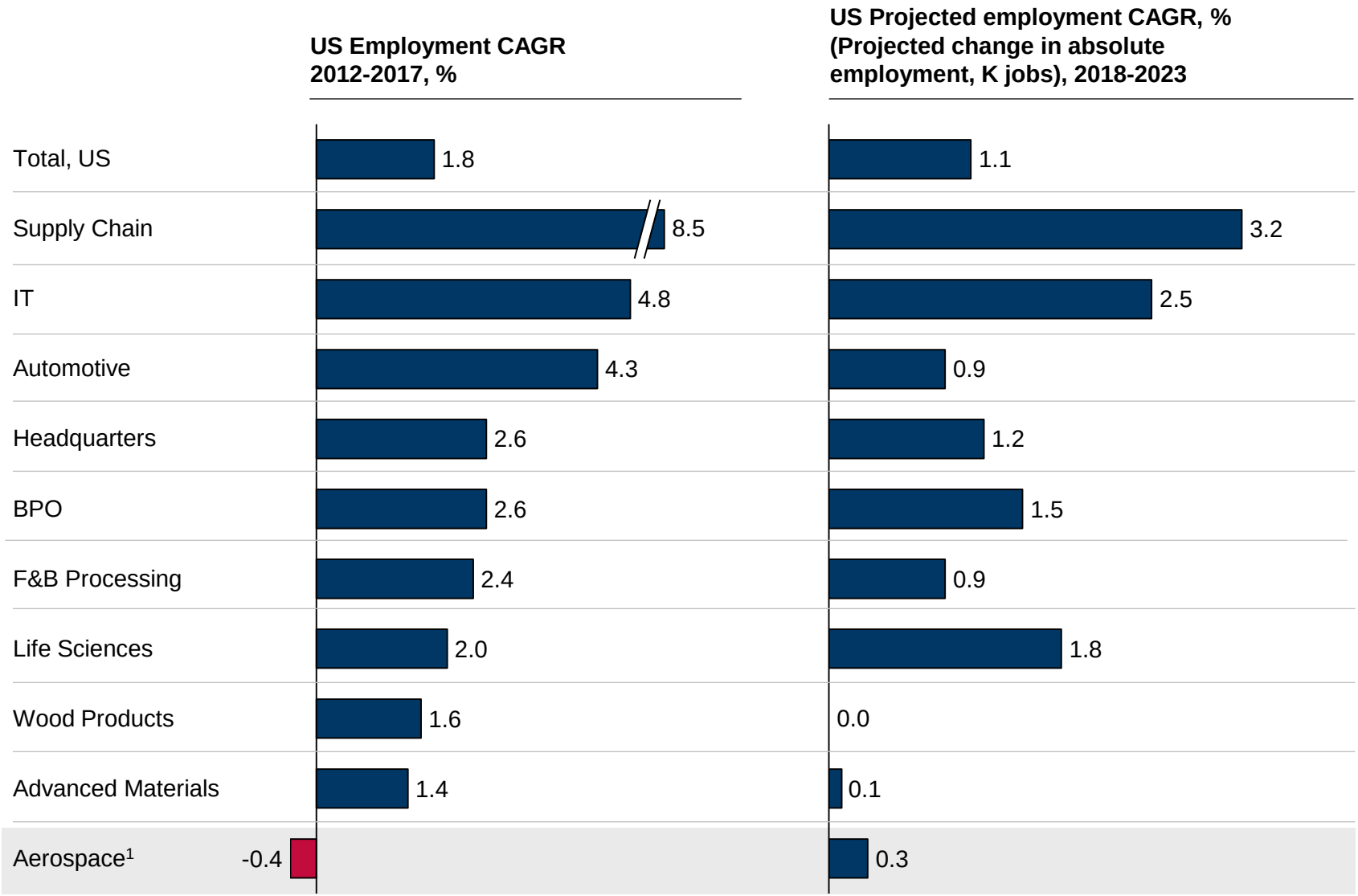
December 11, 2018

VEDP Virginia Economic Development Partnership VEDP.org

TOPICS FOR TODAY'S DISCUSSION

- Overview of employment, growth, and project trends in the aerospace sector today
- What it takes to win in the aerospace and unmanned aerial systems industries
- VEDP's current business development efforts for aerospace and unmanned aerial systems
- Opportunities to strengthen Virginia's position in the aerospace and unmanned aerial systems industries

PAST AND PROJECTED U.S. EMPLOYMENT GROWTH IN THE AEROSPACE INDUSTRY IS SMALL VS. OTHER TARGET SECTORS

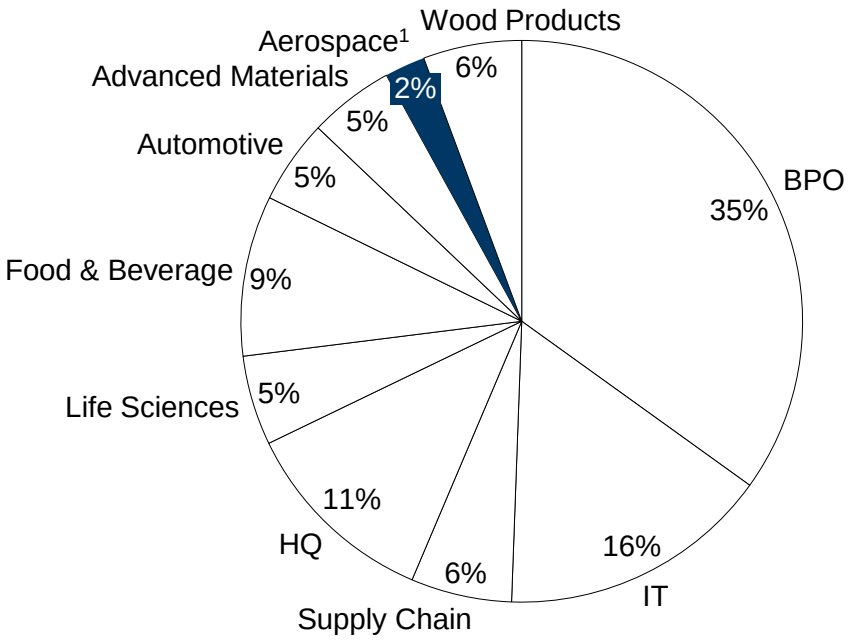


1 Uses NAICS code 3364 (Aerospace manufacturing) to show trends in the industry – other related NAICS codes (e.g., for MRO) include non-aerospace activities, and there is limited historical data available on unmanned systems, due to relatively recent emergence of the sector and lag time in standard reporting

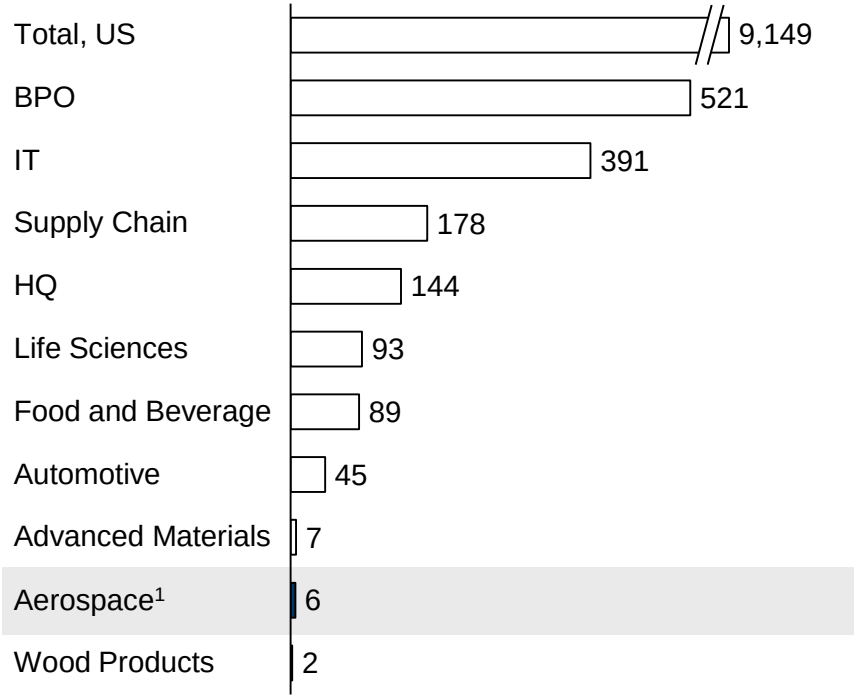
Source: BLS, QCEW

AEROSPACE REPRESENTS A LOW PERCENTAGE OF THE EMPLOYMENT OPPORTUNITY AMONG VEDP'S TARGET SECTORS

Percent of US employment projected in VEDP target sectors 2018-23



Projected change in absolute US employment by sector 2018-23, K jobs



There are limitations to the data available on projected growth for the aerospace sector

- Aerospace and related opportunities also exist within other sectors – such as advanced materials, supply chain, and headquarters
- A large area of projected growth related to aerospace is in unmanned systems, which is not captured in this data, as it is not available yet through standard reporting sources (in 2013, AUVSI estimated job creation in UAV to be >100,000 across the US from 2015-2025)

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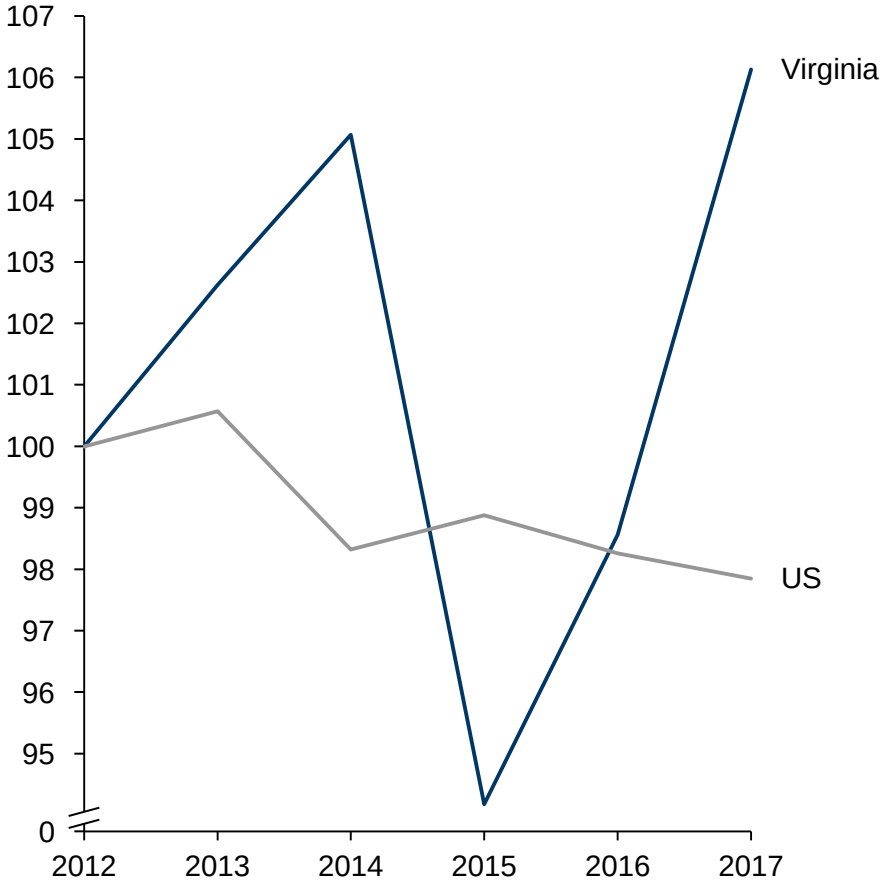
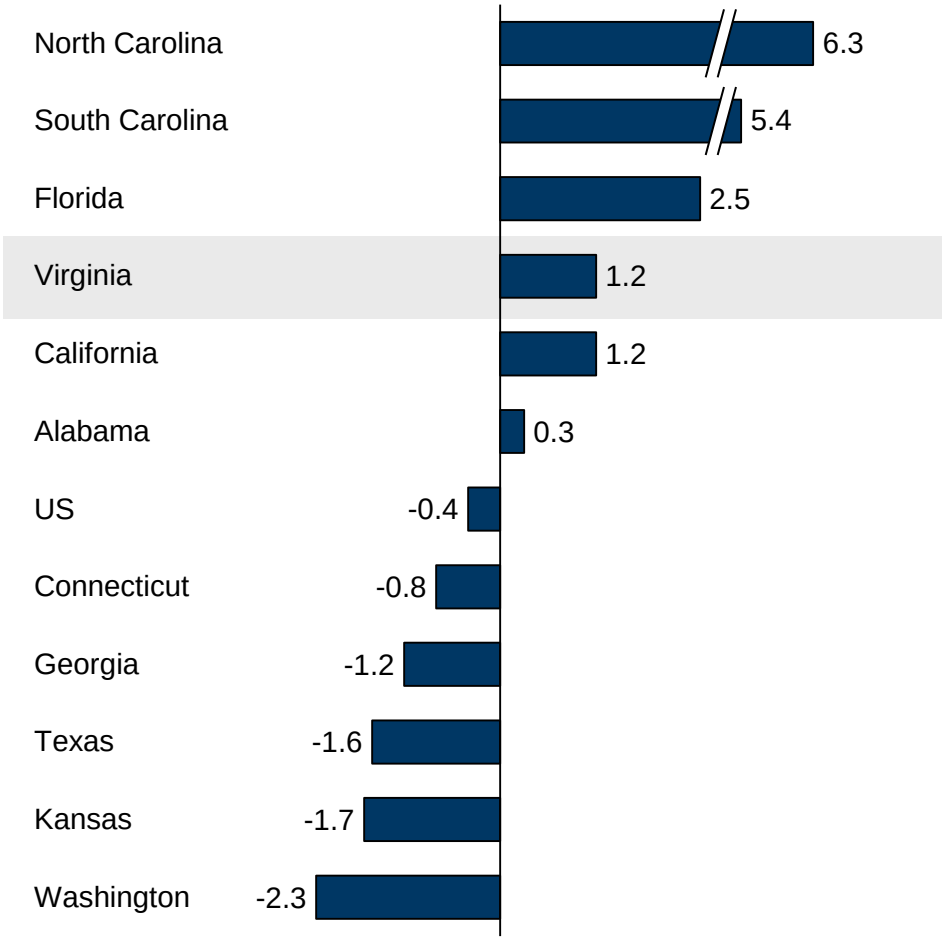
Source: BLS, QCEW

VIRGINIA OUTPERFORMED NATIONAL AEROSPACE GROWTH TRENDS AND RANKED 4TH VS. COMPETITORS FROM 2012-17

Indexed aerospace[1] employment 2012-2017



Aerospace[1] employment CAGR 2012-2017, %



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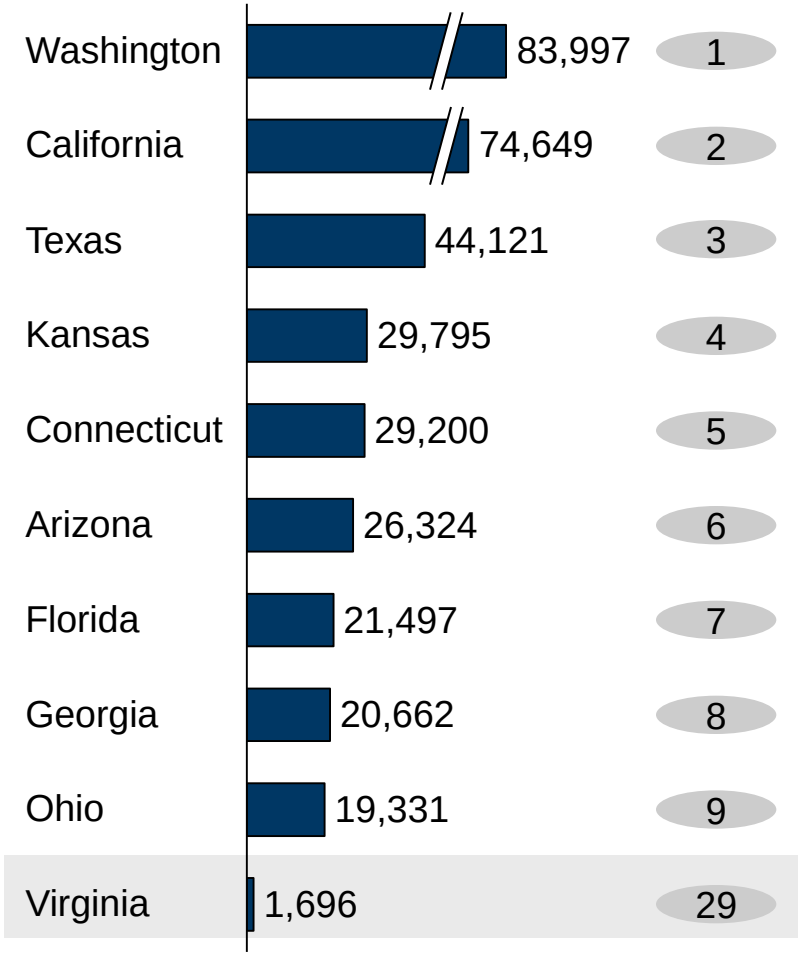
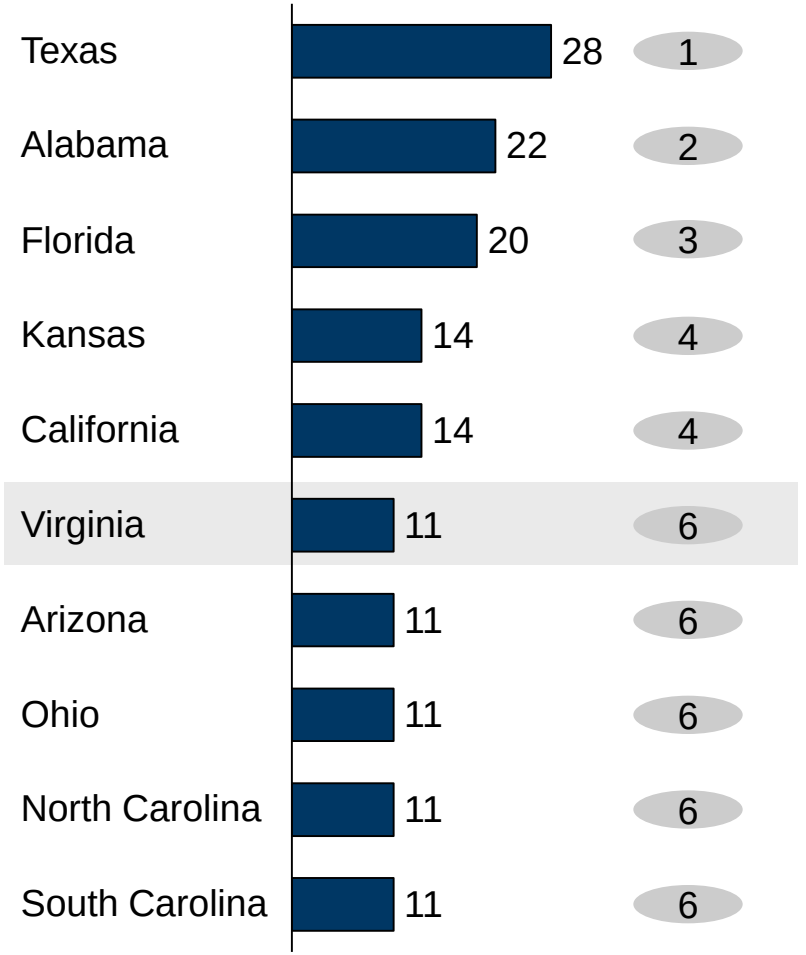
Source: BLS, QCEW

EMPLOYMENT REMAINS CONCENTRATED IN STATES WITH TRADITIONAL CLUSTERS, BUT GROWING HUBS ARE COMPETING IN RECENT PROJECT ANNOUNCEMENTS WITH VIRGINIA TIED FOR 6TH

Top states for aerospace[1] employment, 2017



Top states for aerospace[1] project announcements, 2014-2018



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Source: Conway, BLS, QCEW

VIRGINIA OUTPERFORMS ITS NATIONAL POSITION IN RECENT AEROSPACE PROJECT ANNOUNCEMENTS

Rank by Projects Announced	State	% of National Aerospace Presence, 2017[1]	Count of Projects Announced 2014-18 YTD	% of Total Projects	Sum of New Jobs	% of Total FTE	Sum of Capital Investment by Company, $M	% of Total Invest-ment
1	TX	6.8	28	10.2	2,503	7.4	1,370	14.0
2	AL	2.3	22	8.0	2,489	7.4	483	4.9
3	FL	11.3	20	7.3	2,701	8.0	615	6.3
T-4	KS	5.0	14	5.1	2,342	6.9	1,260	12.9
T-4	CA	18.0	14	5.1	351	1.0	89	0.9
T-6	**VA**	**1.4**	**11**	**4.0**	**661**	**2.0**	**71**	**0.7**
T-6	AZ	3.7	11	4.0	2,420	7.1	579	5.9
T-6	OH	4.2	11	4.0	873	2.6	154	1.6
T-6	NC	1.5	11	4.0	477	1.4	116	1.2
T-6	SC	1.1	11	4.0	524	1.5	77	0.8

- Virginia is tied for 6th in aerospace project wins over the last five years with 11 projects
- Virginia has won an outsized percentage of potential projects and FTEs over the last five years – the Commonwealth is home to only 1.4% of all aerospace establishments nationally (0.4% of jobs), but has won 4% of the total projects and 2% of FTE's

1 Calculated as % of national aerospace establishments housed in the state; by employment, Virginia represents 0.4% of total aerospace employment in the U.S.

Source: Conway; EMSI; VEDP analysis

IN RECENT YEARS, A MAJORITY OF AEROSPACE MANUFACTURING PROJECTS HAVE BEEN EXPANSIONS, NOT NEW SITES

- 60% of aerospace manufacturing projects reported in the last five years were expansions (165 of 274 projects)
- When looking at the 10 largest aerospace manufacturing projects over the last five years:
  - 7 of the 10 largest projects by employment were expansion
  - 6 of the 10 largest projects by investment were expansions
- When looking at the total aerospace manufacturing projects over the last five years, expansion projects made up:
  - 67% of the employment
  - 69% of the investment
- 4 of the top 5 (and 7 of the top 10) states for aerospace manufacturing project announcements are in the top 10 states for aerospace employment

Source: Conway; VEDP analysis

NEW AEROSPACE MANUFACTURING PROJECTS OFTEN FAVOR LARGE INCENTIVES, READY SITES, AND SKILLED WORKFORCE

Key trends in new project wins	Details and examples	Current Virginia context
Large incentives	▪ In 2013, Washington state offered Boeing the largest tax incentive in history with $8.7B over 16 years ▪ Northrop Grumman received ~$500M in incentives from Florida in 2014 for creating 1,800 jobs and $500M in investment ▪ For the 2009 Boeing Project, South Carolina offered $935M in incentives for 3,800 jobs, or more than $246K per job ($456M in property tax breaks, $399M in state bonds for facility construction, $47.5M in income tax credit. $33M in employee training costs)	▪ Virginia has typically had small incentives per job compared to most other southern states (from 2013-17, Virginia's incentive $/capex ratio and incentive $/job ratio across sectors was lower than key competitor states)
Ready sites	▪ Aerospace manufacturing companies generally desire larger sites (100+ acres), near a runway (often 8,000 ft+), in close proximity to interstate with access to workforce, reliable power, ample natural gas ▪ Aerospace companies depend upon sites to be "shovel ready" within increasingly shorter timeframes in order to reduce risk of costly delays	▪ Virginia has only 26 certified sites, half the number of NC and 1/3 the number of GA, AL and TN. ▪ VEDP has launched a site initiative to develop the necessary sites to attract companies in our target sectors including aerospace
Skilled workforce and training capacity	▪ Across all sectors, the demand for a ready and skilled workforce is increasing ▪ GE Aviation (200 jobs, $100M in investment) chose to locate in Indiana in 2014 minutes away from Purdue University, which has a long history of collaboration with GE Aviation ▪ The $158M Airbus deal in Alabama in 2012 included $52M for a training center, where workers are trained at state expense	▪ The Virginia education and workforce ecosystems are well equipped to train workers in specialized fields ▪ Until recently, there has not been funding for a turnkey workforce program that can rapidly produce a company-specific skilled workforce

Source: Conway; Good Jobs First; Press search; JobsOhio McKinsey report

PROJECTS IN GROWTH AREAS, SUCH AS UNMANNED, ARE MORE FOCUSED ON A SUPPORTIVE BUSINESS CLIMATE (1/2)

Key trends in new project wins	Details and examples	Current Virginia context
Tailored state incentives for early stage firms	▪ Young, high growth companies need upfront funding and have low, often unpredictable initial employment and investment – which is not the profile for most state incentives ▪ A number of companies have moved into Central NY because they won state incentives totaling >$50M to date and GENIUS NY grants (world's largest startup accelerator focused on unmanned systems, with $3M/year in grant money for unmanned companies funded by the state)	▪ While there is some grant and seed funding programs (e.g., from CIT), Virginia's state incentives require higher levels of employment and investment than startups are able to commit to
Regulatory freedom and support from state leadership	▪ Regulatory freedom is critical to being able to test their products ▪ State support is important as regulations and policies for the industry are currently being determined and are a source of unpredictability ▪ Kratos Defense & Security Solutions opened a 350-job, 100,000-sq. ft. unmanned aircraft manufacturing facility in Oklahoma City, with President and CEO of Kratos Eric DeMarco noting that "Kratos chose Oklahoma with strong encouragement from its Congressional Delegation"	▪ Virginia has FAA-designated test sites and federal UAS Integration Pilot Program (IPP) test sites ▪ Virginia's move to pre-empt local laws governing drone usage makes the industry more predictable in Virginia

Source: Press search; VEDP analysis

PROJECTS IN GROWTH AREAS, SUCH AS UNMANNED, ARE MORE FOCUSED ON A SUPPORTIVE BUSINESS CLIMATE (2/2)

Key trends in new project wins	Details and examples	Current Virginia context
Existing relevant infra-structure	▪ Large-scale capital infrastructure (e.g,, testing sites, hangar space, space port) along with the opportunity for partnerships for companies to utilize that infrastructure is a key decision maker ▪ Unifly (European unmanned systems software company) chooses Central New York, with a focus on a partnership with Griffiss International Airport to use and enhance its 50-mile test site unmanned traffic management corridor	▪ Virginia is a strong player in the space with a number of relevant assets (e.g., Virginia Tech Drone Park, space port)
Skilled workforce	▪ Unmanned systems startups focus recruiting on STEM backgrounds, with the most common occupations being aerospace engineers	▪ Virginia has a strong STEM talent pipeline ▪ Top Virginia schools (e.g., UVA, Virginia Tech) have devoted unmanned resources

Source: Conway; press search; JobsOhio McKinsey report; VEDP analysis

VIRGINIA HAS A UNIQUE SPACEPORT ASSET THAT WE CAN USE TO ATTRACT RELATED PROJECTS

- MARS at Wallops Island is 1 of 4 US Spaceports licensed by the FAA to launch rockets into orbit
- It provides launch pads for International Space Station cargo delivery, and scientific, DoD, and commercial missions
- MARS is home to Northrop Grumman Antares and Minotaur rockets, and the new home to Rocket Lab Electron rocket
- The location of Wallops is best for launching into the high demand mid-to-low inclination orbits (38 to 60 degrees above and below the equator)
- There are 3 runways of 4,800-8,750 ft. for extensive aviation activities, and aircraft launched rockets
- It has a 3,000 ft. dedicated UAV runway and test range within NASA restricted airspace
- NASA's controlled rocket range is located here, with more than 16,000 launches over 70 years, including fire, safety, and extensive rocket and satellite support services

VEDP IS WORKING TO IDENTIFY SPACE-RELATED BUSINESS DEVELOPMENT OPPORTUNITIES – WHICH WILL REQUIRE STATE ACTION AND SUPPORT

Potential space-related business development opportunities and enablers for Virginia

- Continue to support our space-related state players (e.g., Virginia Space and MARS, NASA Langley) and partner with them on business development opportunities
- Invest in infrastructure around the space port (e.g., develop high-bay spec buildings to accommodate final assembly of rockets and integration of small satellites for the new family of venture-class launch manufacturers)
- Attract and partner with the venture capital firms focused on space startups to target young, high growth space sector companies by (e.g., Space Angels Network, Founders Fund)
- Create a space-focused grant program or other dedicated incentive funding mechanism to signal and support Virginia's potential in this sector
- Continue to market Virginia's supporting assets for the sector to space-related companies, like its strong pipeline of STEM talent, its federal agencies and other government customers, etc.

Examples from other states

Research on best practices from space states like Florida, Alabama, and Colorado have committed to space-related development. Some key trends in their success have included:

- Sector funding for organization (Florida has dedicated a ~$20M budget to space-related economic development)
- Vocal state leadership support (Blue Origin decision for Alabama appears to have been made in part due to the vocal support of the space industry by government officials)
- Funding, both for projects as well as for ongoing space-related infrastructure development (e.g., Florida Space included in its state budget $34M for launch complex improvements for FY2017 that support company attraction)

Source: Press search

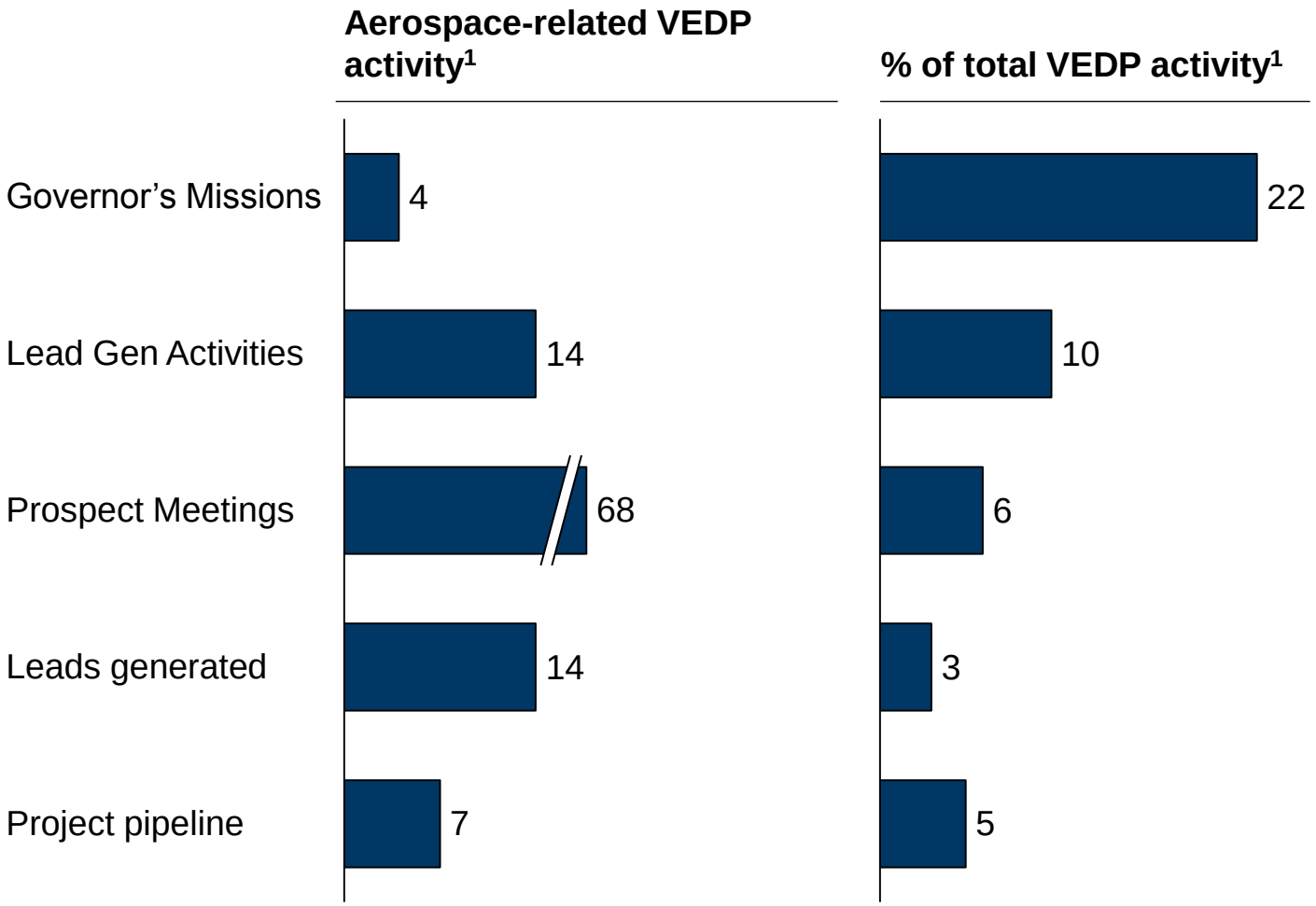
VEDP HAS PRIORITIZED AEROSPACE AND UNMANNED IN ITS BUSINESS DEVELOPMENT EFFORTS (1/2)

Type of change or action	Select examples
Strategic	▪ Since the JCOTS January 2017 report, VEDP has pivoted to sector-focused business development efforts, of which aerospace is a key target and unmanned systems is a separate target (with a strategic focus on the unmanned aerial systems subsegment) ▪ Developed industry strategies focused on tactical high-yield lead generation efforts for the aerospace and unmanned sectors, including how to focus our efforts on high value targets
Organi-zational	▪ Designated a Managing Director to lead the aerospace industry effort, and a second Managing Director to lead unmanned systems ▪ Business development efforts supported by a Research Manager who is focusing on key economic trends, current news, and potential business development opportunities in aerospace and unmanned sectors ▪ Business development efforts supported by Economic Competitiveness Director executing a corporate intelligence program to identify companies that are best positioned to expand in the near team that VEDP should target – aerospace and unmanned systems are sectors of focus for this exercise ▪ Launched a Business, Retention & Expansion team, that in part targets Virginia's key aerospace and unmanned companies for retention as well as expansion opportunities

VEDP HAS PRIORITIZED AEROSPACE AND UNMANNED IN ITS BUSINESS DEVELOPMENT EFFORTS (2/2)

Type of change or action	Select examples
Tactical	▪ Prioritized aerospace and unmanned systems sectors for a new corporate intelligence effort led by the Economic Competitiveness team, in which VEDP takes a data-oriented approach to identifying companies in our target sectors ▪ In FY18 and FY19, VEDP executed 10 lead generation activities targeting the aerospace and unmanned sectors ▪ Launched a new VEDP website that includes comprehensive information promoting Virginia's aerospace and unmanned assets ▪ Developed new marketing collateral for aerospace and unmanned Systems, including promoting 8 industrial sites in Virginia with AirPark Access to market to Aerospace manufacturers, R&D and FBO/MRO ▪ Business Retention and Expansion program targeting high-value companies
Partnership	▪ Coordinating partnership with MAAP & AUVSI Virginia Chapter, and participated in AUVSI Symposium at Virginia Tech in October 2018 ▪ VEDP has Active Partnerships with the following allies in Virginia: – CIT: Active discussions with CIT on Aerospace and Unmanned Systems – Mid-Atlantic Regional Spaceport: Worked with Dale Nash on 2 projects in 2018 – Department of Aviation: Attended NBAA in October 2018 – following up on one project for an FBO; attended Department of Aviation Board meeting – introduced Managing Director for Aerospace to the Board in November 2018; coordinating with Department of Aviation on participation with Governor's Aerospace Advisory Council – NASA-Langley: Coordinating with Hampton Roads region and NASA-Langley's Regional Economic Development team to identify expansion and collaboration opportunities with existing Aerospace companies in Virginia

NEARLY 10% OF VEDP'S LEAD GEN ACTIVITIES ARE FOCUSED ON AEROSPACE AND UNMANNED SECTORS, INCLUDING >20% OF GOVERNOR'S MISSIONS, OUR HIGHEST PROFILE ACTIVITY



1 Reflects activities from July 2017 to Dec. 2018, with Governor's Missions reflected from Jan. 2017 to Dec. 2018

OPPORTUNITIES FOR VIRGINIA TO STRENGTHEN ITS AEROSPACE AND UNMANNED SECTORS FOR ECONOMIC DEVELOPMENT

Key trends in the aerospace sector

1. Growth in the unmanned aerial systems market (and in its defense applications)
2. Small satellite launches and commercial space
3. Overall increased focus on technology and R&D in the aerospace sector

Examples of how Virginia can capitalize on these trends

- Develop a funding source dedicated to incentives for small, high growth firms in the unmanned and space subsectors
- Consider creating a Virginia aerospace economic development-focused arm under VEDP with dedicated state funding
- Commit to offering more competitive incentive packages for high-impact aerospace projects
- Expand funding available to prepare project-ready sites
- Invest in marketing to better promote awareness of Virginia's aerospace assets
- Expand programs to commercialize research from Virginia's federal labs and universities, which produce large amounts of industry-related research but underperform in converting that research to commercial assets
- Expand our position as a leader in regulatory experimentation to accommodate innovations in the aerospace industry from smaller players (e.g., startups)

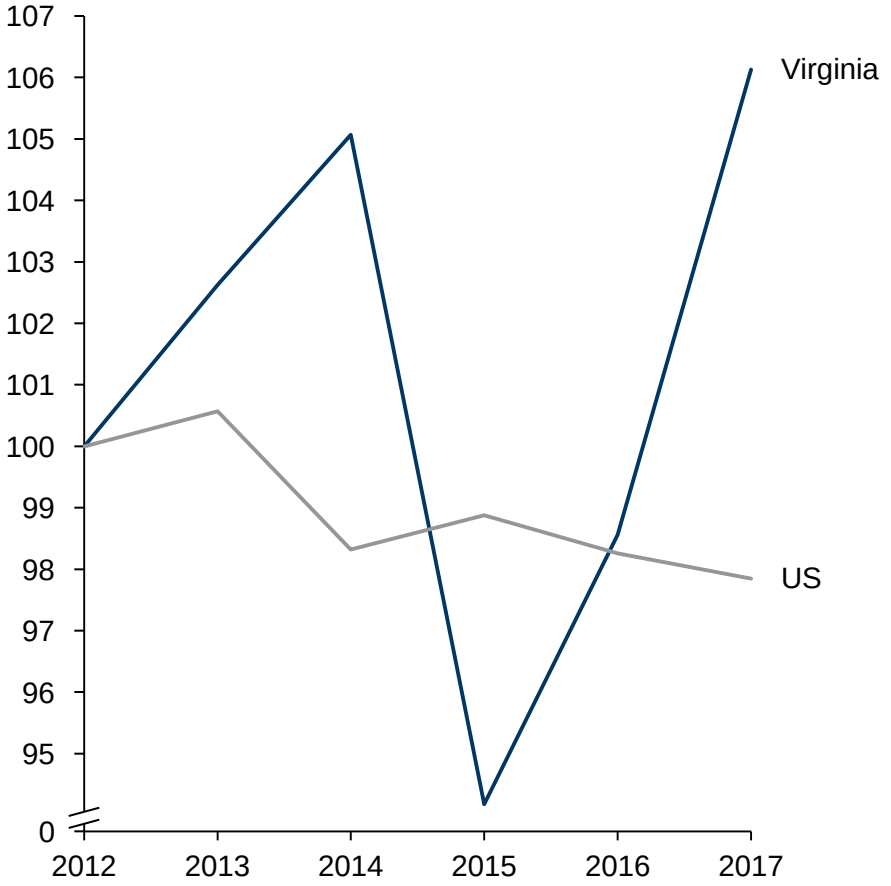
What VEDP is already doing to support business development for these trends

- Prioritizing related subsectors for all lead generation activities
- Executing a corporate intelligence strategy to identify high potential target companies that will see growth from these market trends
- Targeting opportunities related to these trends for existing Virginia companies (e.g., government and defense contractors)
- Marketing key Virginia assets (e.g., space port, testing sites) to attract opportunities
- Continuing to build relationships with and support key stakeholders and industry leaders that help Virginia navigate related opportunities (e.g., provided project support to MARS for commercial space exploration projects focused on emerging small satellite market)

APPENDIX

VIRGINIA OUTPERFORMED NATIONAL AEROSPACE GROWTH TRENDS AND RANKED 4TH VS. COMPETITORS FROM 2012-17

Indexed aerospace[1] employment 2012-2017



Aerospace[1] employment CAGR 2012-2017, %		Absolute employment change 2012-2017, jobs
North Carolina	6.3	1,652
South Carolina	5.4	1,764
Florida	2.5	2,451
Virginia	1.2	98
California	1.2	4,167
Alabama	0.3	215
US	-0.4	10,657
Connecticut	-0.8	(1,158)
Georgia	-1.2	(1,340)
Texas	-1.6	(3,819)
Kansas	-1.7	(2,614)
Washington	-2.3	(10,227)

1 Uses NAICS code 3364 (Aerospace manufacturing) to show trends in the industry – other related NAICS codes (e.g., for MRO) include non-aerospace activities, and there is limited historical data available on unmanned systems, due to relatively recent emergence of the sector and lag time in standard reporting

Source: BLS, QCEW

ACROSS THE US, VIRGINIA IS 15TH IN EMPLOYMENT GROWTH IN THE AEROSPACE SECTOR FROM 2012 TO 2017

Aerospace employment CAGR 2012-2017, %

Rank	State	2012-2017 CAGR
	U.S.	-0.4%
1	Idaho	7.7%
2	North Carolina	6.3%
3	Montana	5.7%
4	South Carolina	5.4%
5	Michigan	5.3%
6	Minnesota	5.1%
7	Ohio	3.7%
8	Utah	3.1%
9	Tennessee	3.0%
10	Oklahoma	2.6%
11	Florida	2.5%
12	Missouri	2.1%
13	Colorado	1.6%
14	Wisconsin	1.6%
15	**Virginia**	**1.2%**
16	California	1.2%
17	Illinois	1.1%
18	Oregon	0.6%
19	Nebraska	0.6%
20	Louisiana	0.4%

Rank	State	2012-2017 CAGR
21	Alabama	0.3%
22	New Hampshire	-0.2%
23	Arizona	-0.2%
24	Wyoming	-0.7%
25	Kentucky	-0.7%
26	Connecticut	-0.8%
27	Georgia	-1.2%
28	Arkansas	-1.5%
29	Texas	-1.6%
30	Kansas	-1.7%
31	Washington	-2.3%
32	West Virginia	-2.4%
33	Vermont	-2.6%
34	Massachusetts	-2.8%
35	New Jersey	-3.0%
36	Indiana	-3.0%
37	Delaware	-3.5%
38	Nevada	-3.8%
39	Mississippi	-4.5%
40	Pennsylvania	-4.6%
41	New Mexico	-5.2%
42	New York	-6.3%
43	Maryland	-16.4%

Source: BLS, QCEW

MAJOR NEW PROJECT ANNOUNCEMENTS BY JOBS CREATED

Rank	Company	State	Sum of New Jobs	Sum of Investment, $M	Year Announced	Sum of Incentives, $M	Incentives per Employee, $
1	Boeing	SC	3800	750	2009	935	246,000
2	Sierra Completions	CO	2100	88	2015	400	190,500
3	SyberJet	UT	1200	380	2014	43	36,000
4	Cessna	KS	1010	780	2008	33	33,000
T-5	Spirit Aero	NC	1000	570	2008	250	250,000
T-5	Gulfstream	GA	1000	500	2010	30	30,000
7	Laurentian	NY	900	175	2010	12	13,000
8	Boeing	MO	700	0	2014	1,700	2,429,000
9	Embraer	FL	600	0	2013	50	83,000
10	Lockheed	CO	550	350	2013	50	53,818
AVERAGE							**336,000**
MEDIAN							**83,000**

1 Calculated as % of national aerospace establishments housed in the state
Source: Conway, EMSI

VIRGINIA ANNOUNCEMENTS – LAST FIVE YEARS

Company	Location	New or Expansion	Type of Operation	Sum of New Jobs	Sum of Investment, $M	Year Announced
Aurora Flight Sciences Corp	Manassas	Expansion	R&D	135	14	2018
KMR Aviation Services Inc.	Lynchburg	Expansion	Services	12	1	2018
Boeing	Arlington	New	HQ	50	0	2017
Mikro Systems, Inc.	Albemarle	Expansion	Manufacturing	38	2	2017
Euro Composites	Culpepper	Expansion	Manufacturing	58	11	2016
Textron, Inc.	Nottoway	New	Manufacturing	50	1	2016
Eagle Distributing Enterprises, Inc.	Hampton	Expansion	Manufacturing	3	1	2015
Aerojet Rocketdyne, Inc.	Orange	Expansion	Manufacturing	100	11	2015
Ball Aerospace & Technologies Corp.	Fairfax	New	Manufacturing	60	2	2014
Airbus	Loudon	Expansion	Manufacturing	0	2	2014
Kilgour Industries	Martinsville	New	Manufacturing	155	27	2014
SUM				**661**	**71**	

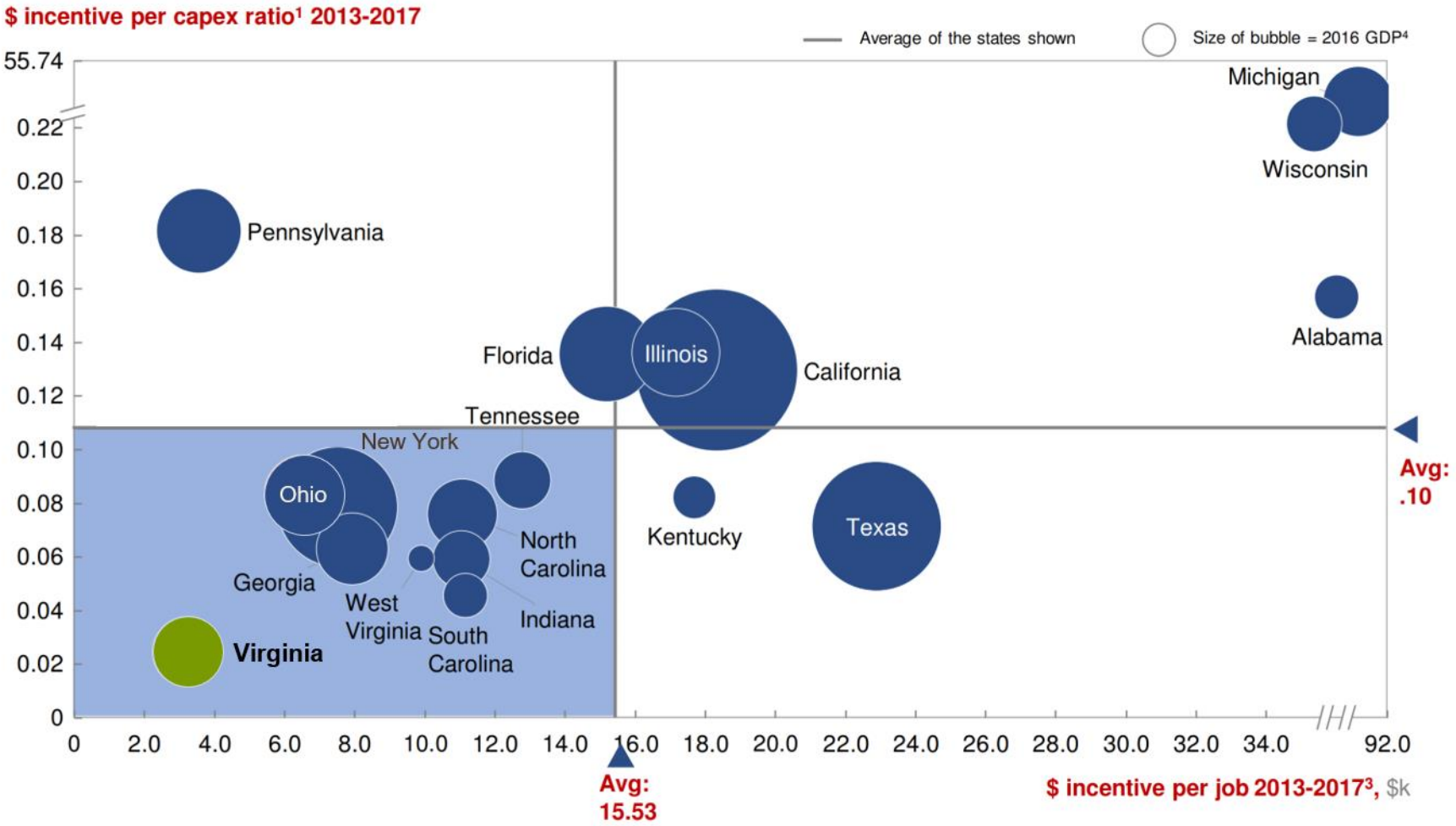
Source: Conway

TOP TEN INDUSTRIES BY TOTAL INCENTIVES SINCE 1976

Rank	Industry	Total Incentives, $ Million
1	Utilities and Power Generation	36,026
2	**Aerospace and Military Contracting**	**23,327**
3	Motor Vehicles	22,703
4	Electrical and Electronic Equipment	16,722
5	Diversified	12,764
6	Oil and Gas	11,427
7	Financial Services	11,316
8	Chemicals	9,838
9	Metals	9,482
10	Real Estate	6,467

Source: Good Jobs First; VEDP analysis

VIRGINIA RANKS LOWEST IN INCENTIVES PER JOBS AND CAPEX VS. COMPETITOR STATES



1 Considers total incentives divided by sum of capex promised by each deal at the time of deal announcement; 2 Considers OH, regional peers, and competitive peers; Data for OH and all peer states except AL and TN pulled February 14, 2018; data for AL and TN pulled March 5, 2018; 3 Considers total incentives divided by the sum of jobs (created and safeguarded) promised by each deal at the time of deal announcement; 4 2016 real GDP (chained to 2009 USD), M SOURCE: IncentivesMonitor – WAVTEQ (www.IncentivesMonitor.com), Moody's